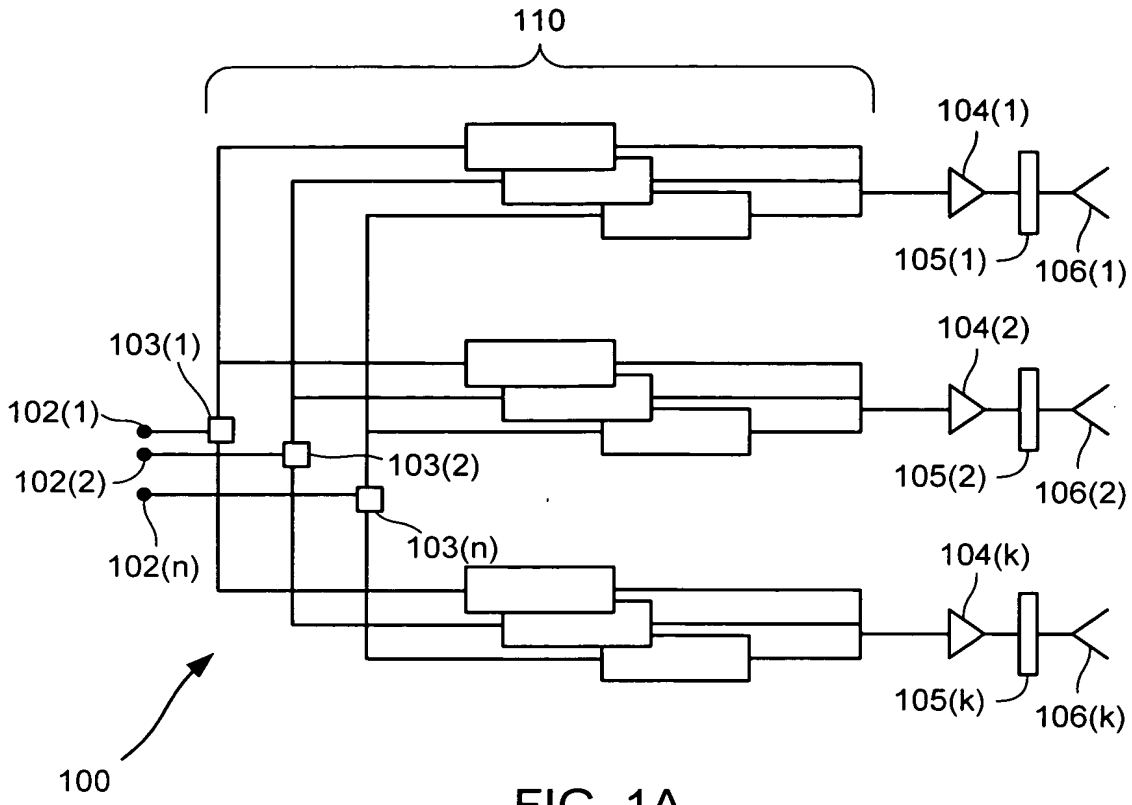
110
104(1)
105(1)
106(1)
103(1)
102(1)
104(2)
102(2)
103(2)
105(2)
106(2)
102(n)
103(n)
104(k)
105(k)
106(k)
100

FIG. 1A

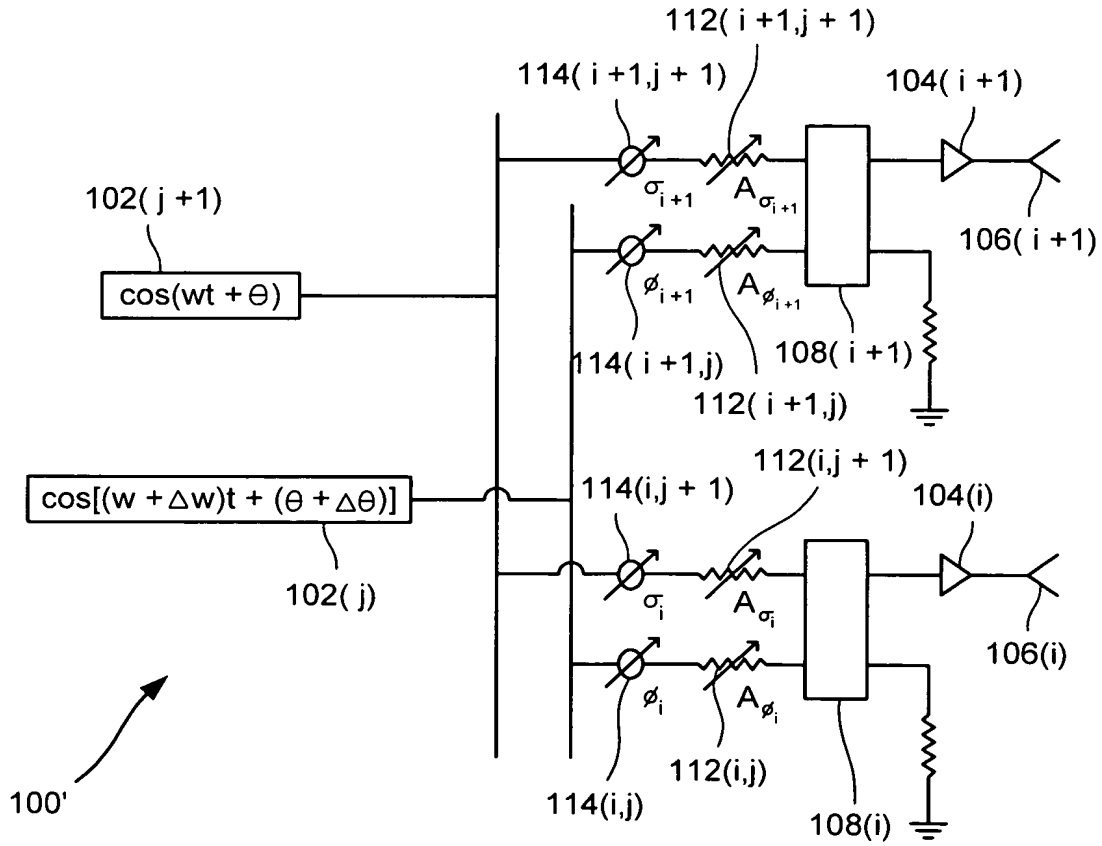
112(i +1,j + 1)
114(i +1,j + 1)
104(i +1)
σi +1
Aσi +1
102(j +1)
106(i +1)
cos(wt +Θ)
øi +1
Aøi +1
114(i +1,j)
108(i +1)
112(i +1,j)
112(i,j + 1)
cos[(w +Δw)t + (Θ +ΔΘ)]
114(i,j + 1)
104(i)
σi
Aσi
102(j)
106(i)
øi
Aøi
112(i,j)
114(i,j)
108(i)
100'

FIG. 1B

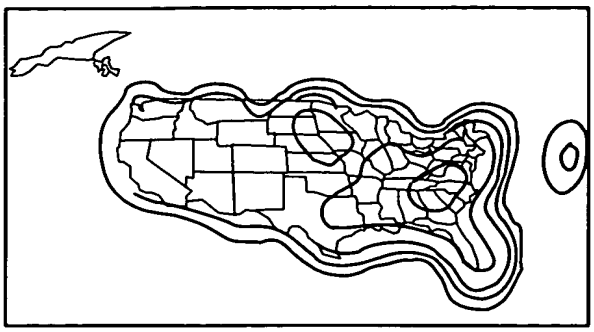

FIG. 2A

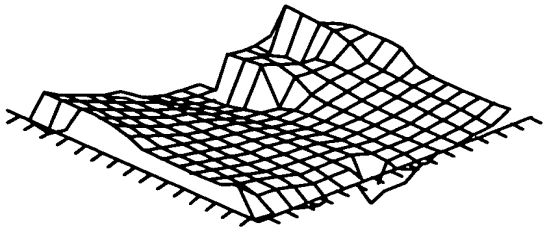

FIG. 2B

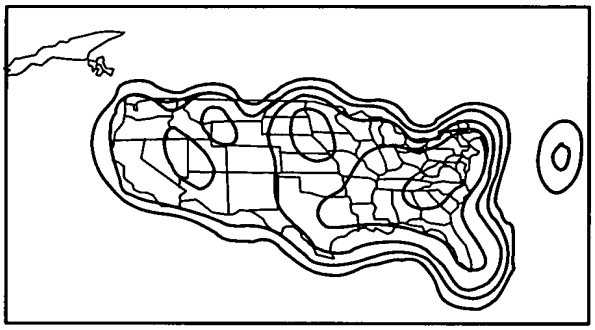

FIG. 2C

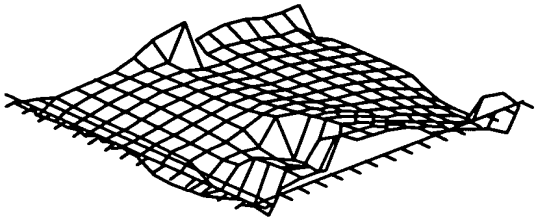

FIG. 2D

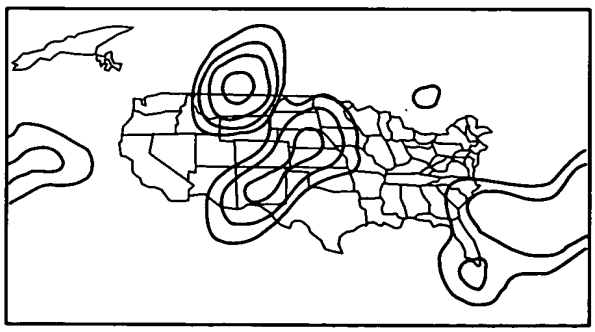

FIG. 2E

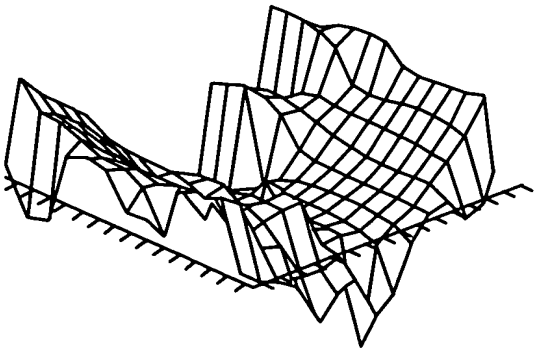

FIG. 2F

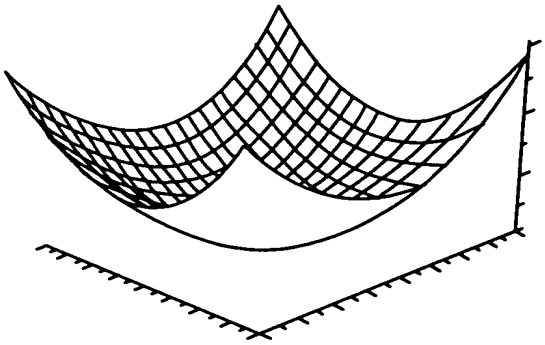

FIG. 3A

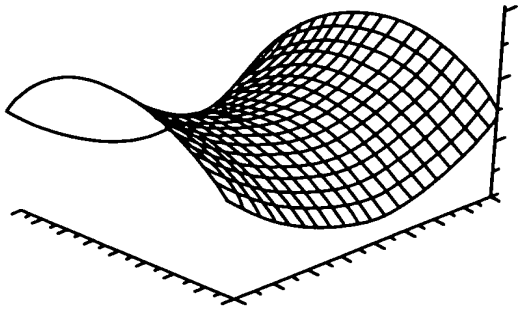

FIG. 3D

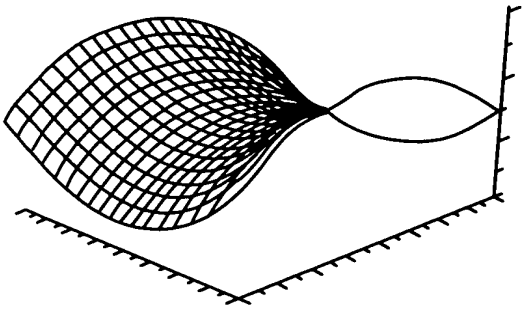

FIG. 3B

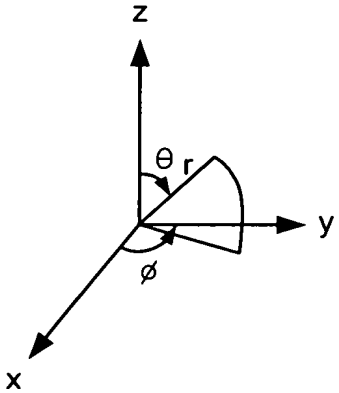

FIG. 3E

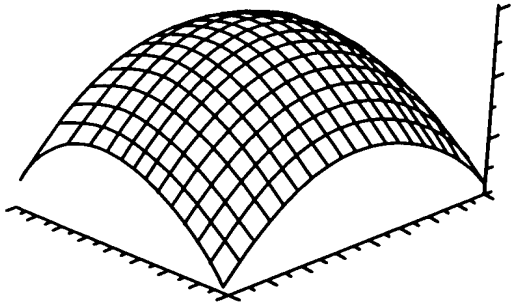

FIG. 3C

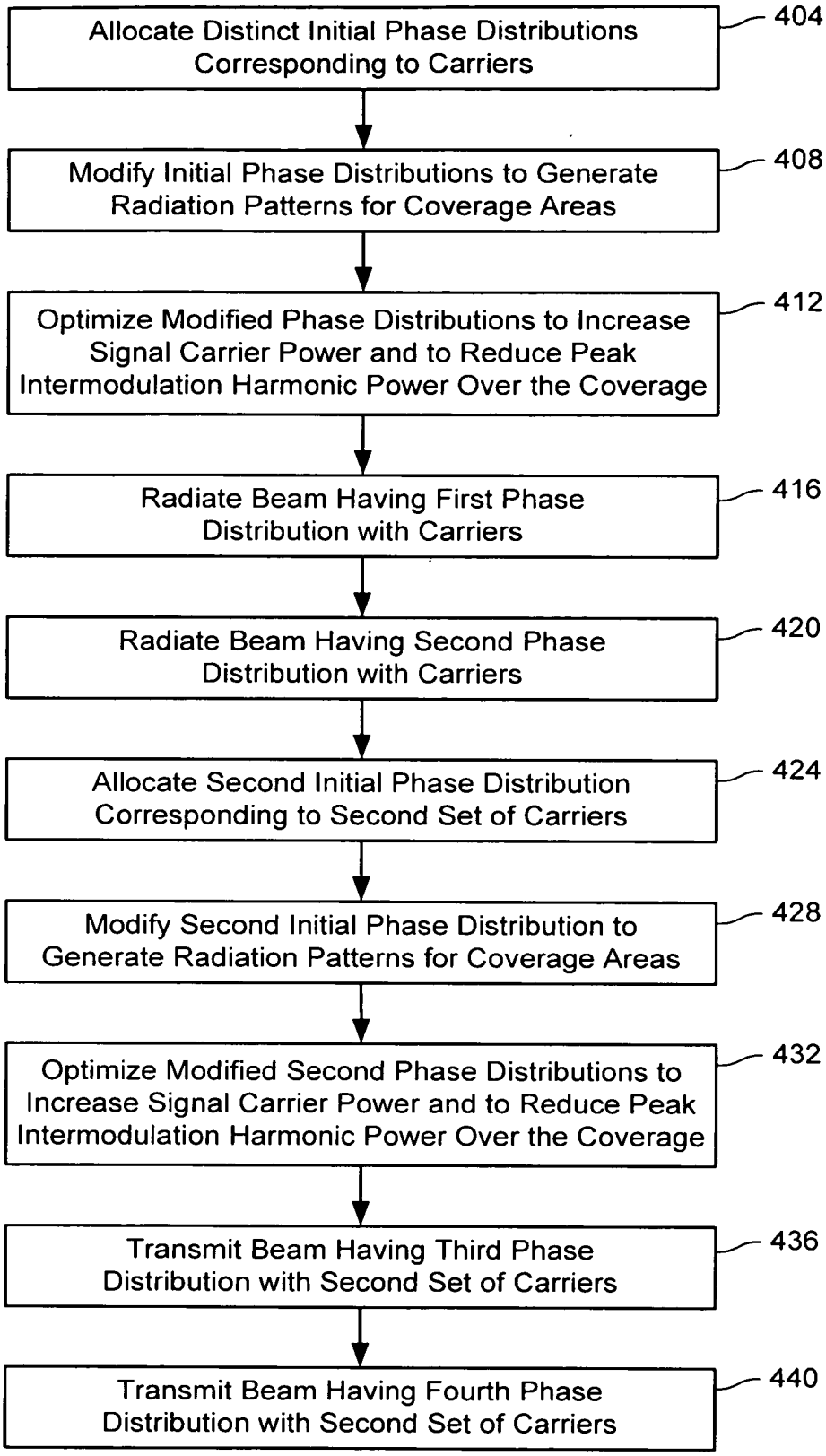
Allocate Distinct Initial Phase Distributions Corresponding to Carriers
404
Modify Initial Phase Distributions to Generate Radiation Patterns for Coverage Areas
408
Optimize Modified Phase Distributions to Increase Signal Carrier Power and to Reduce Peak Intermodulation Harmonic Power Over the Coverage
412
Radiate Beam Having First Phase Distribution with Carriers
416
Radiate Beam Having Second Phase Distribution with Carriers
420
Allocate Second Initial Phase Distribution Corresponding to Second Set of Carriers
424
Modify Second Initial Phase Distribution to Generate Radiation Patterns for Coverage Areas
428
Optimize Modified Second Phase Distributions to Increase Signal Carrier Power and to Reduce Peak Intermodulation Harmonic Power Over the Coverage
432
Transmit Beam Having Third Phase Distribution with Second Set of Carriers
436
Transmit Beam Having Fourth Phase Distribution with Second Set of Carriers
440

FIG. 4

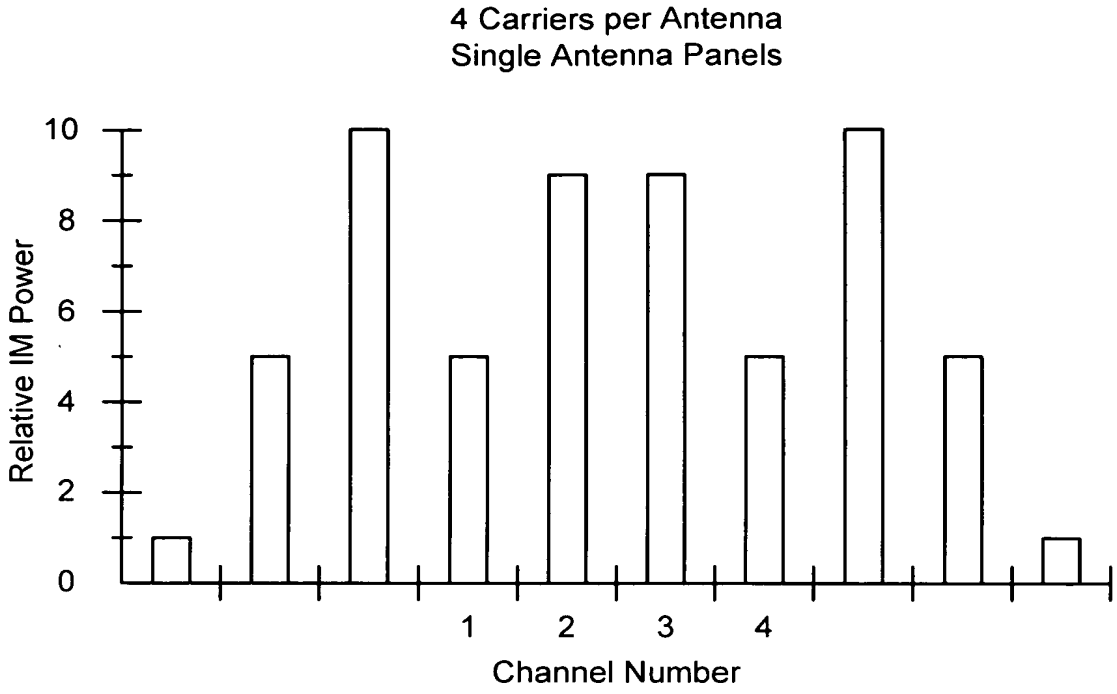
4 Carriers per Antenna
Single Antenna Panels
Relative IM Power
10
8
6
4
2
0
1
2
3
4
Channel Number

FIG. 5A

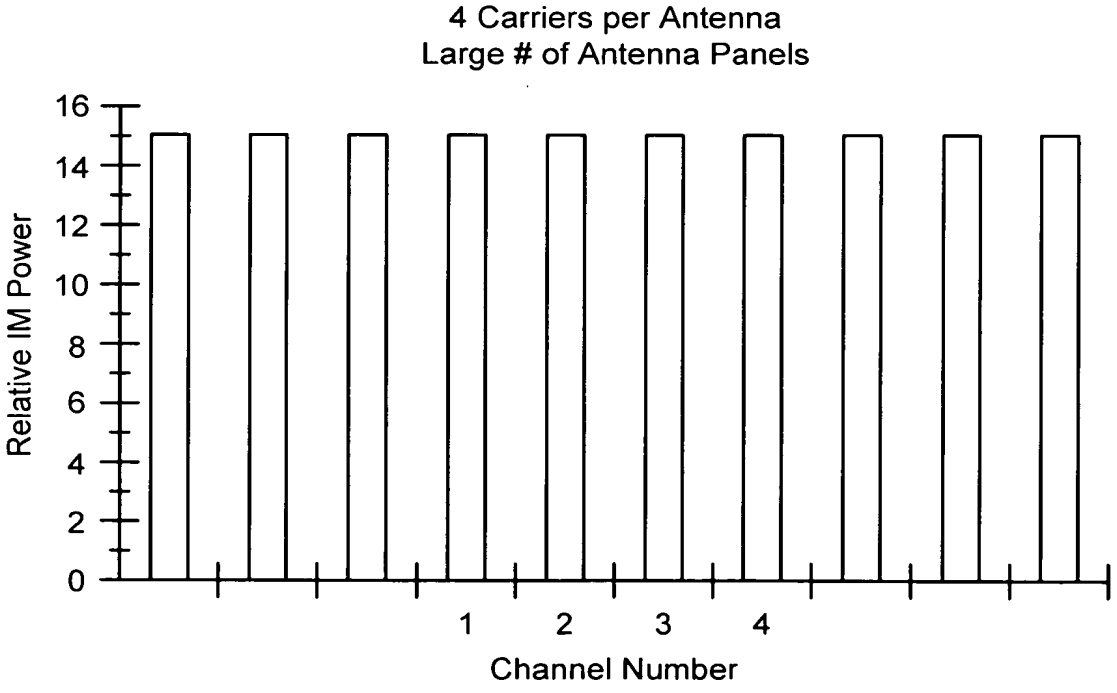
4 Carriers per Antenna
Large # of Antenna Panels
Relative IM Power
16
14
12
10
8
6
4
2
0
1
2
3
4
Channel Number

FIG. 5B

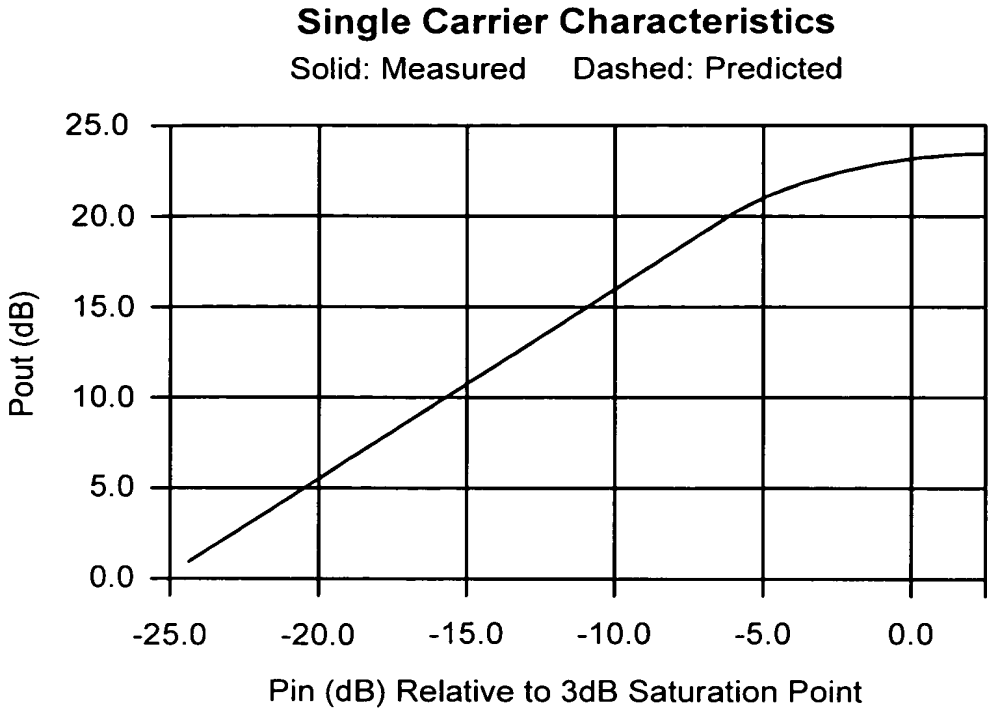
Single Carrier Characteristics
Solid: Measured Dashed: Predicted
25.0
20.0
15.0
10.0
5.0
0.0
Pout (dB)
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
Pin (dB) Relative to 3dB Saturation Point

FIG. 6A

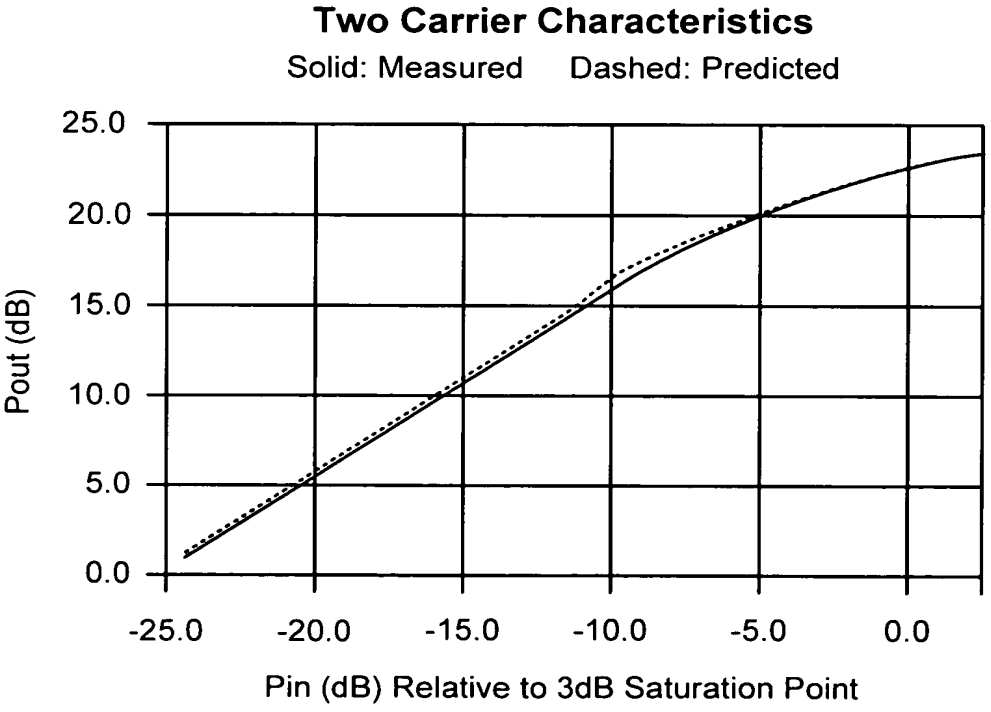
Two Carrier Characteristics
Solid: Measured Dashed: Predicted
25.0
20.0
15.0
10.0
5.0
0.0
Pout (dB)
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
Pin (dB) Relative to 3dB Saturation Point

FIG. 6B

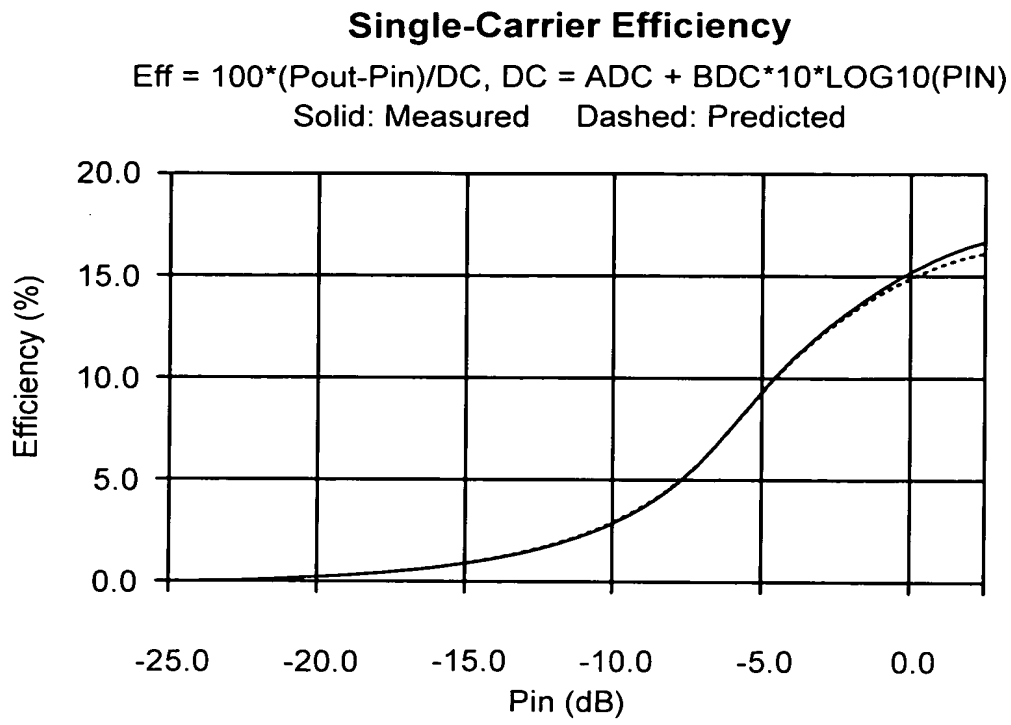
Single-Carrier Efficiency
Eff = 100*(Pout-Pin)/DC, DC = ADC + BDC*10*LOG10(PIN)
Solid: Measured Dashed: Predicted
20.0
15.0
10.0
5.0
0.0
Efficiency (%)
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
Pin (dB)

FIG. 6C

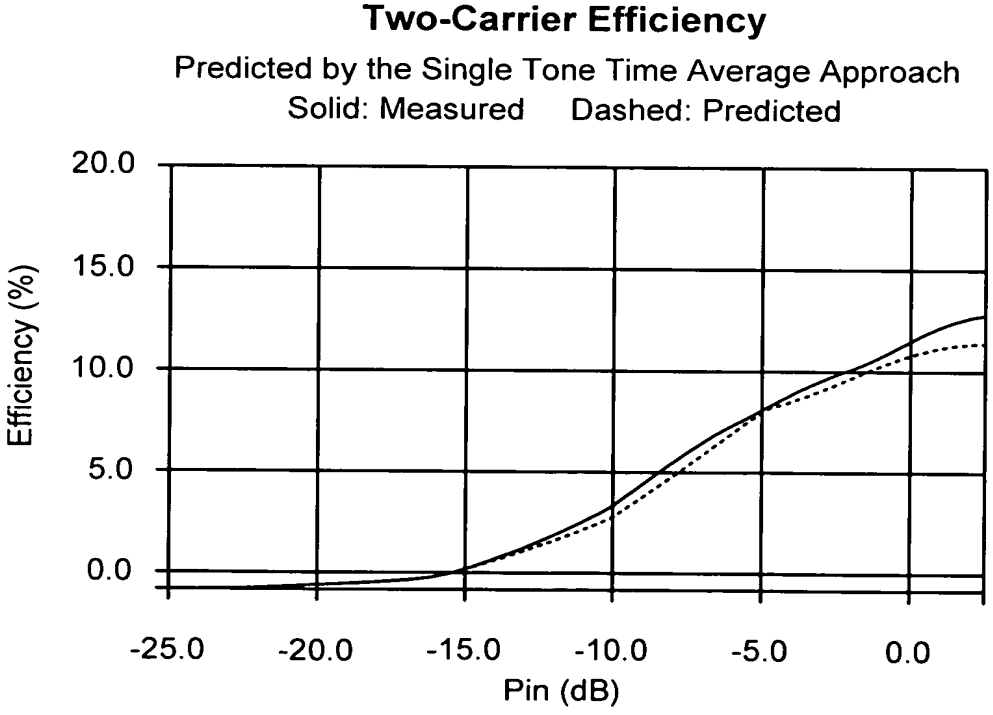
Two-Carrier Efficiency
Predicted by the Single Tone Time Average Approach
Solid: Measured Dashed: Predicted
20.0
15.0
10.0
5.0
0.0
Efficiency (%)
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
Pin (dB)

FIG. 6D

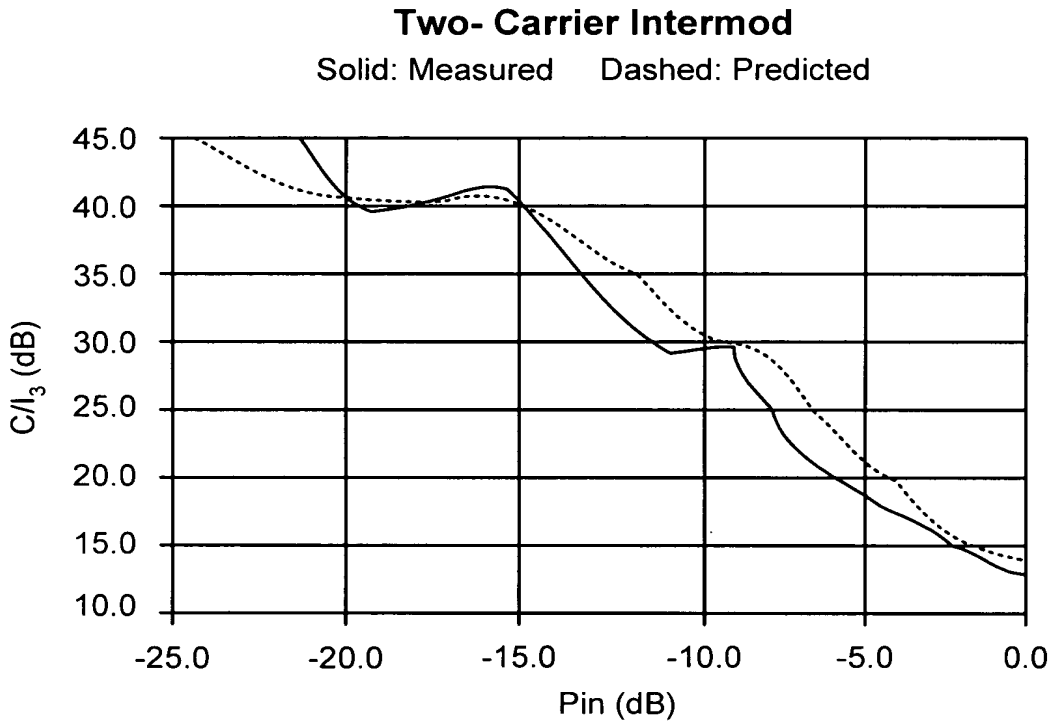
Two- Carrier Intermod
Solid: Measured Dashed: Predicted
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
C/I3 (dB)
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
Pin (dB)

FIG. 6E

Ku-Band

Active array, 16x16 alam. alcm size = 3.0 lamda
EIRP-Optimized Pattern with Paraboloidal-Type Phase
Relative Pattern

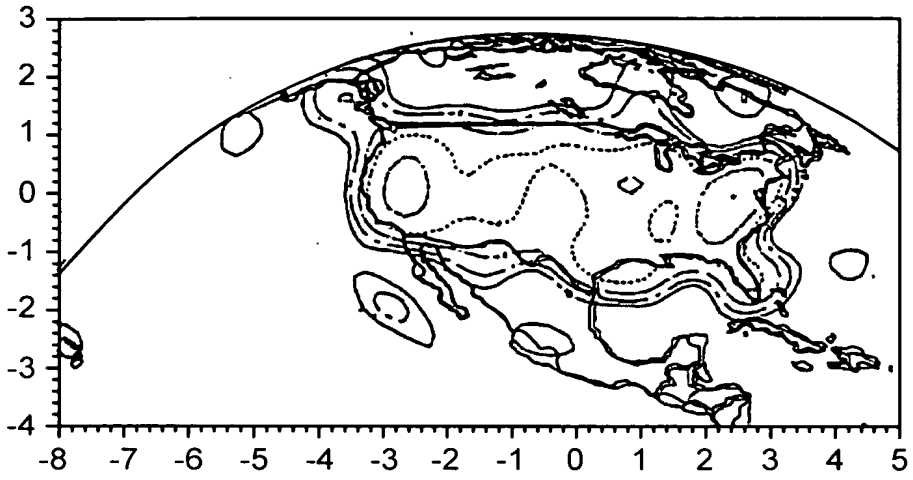

FIG. 7A

Ku-Band

Active array, 16x16 alam. alcm size = 3.0 lamda
EIRP-Optimized Pattern with Saddle-Type Phase
Relative Pattern

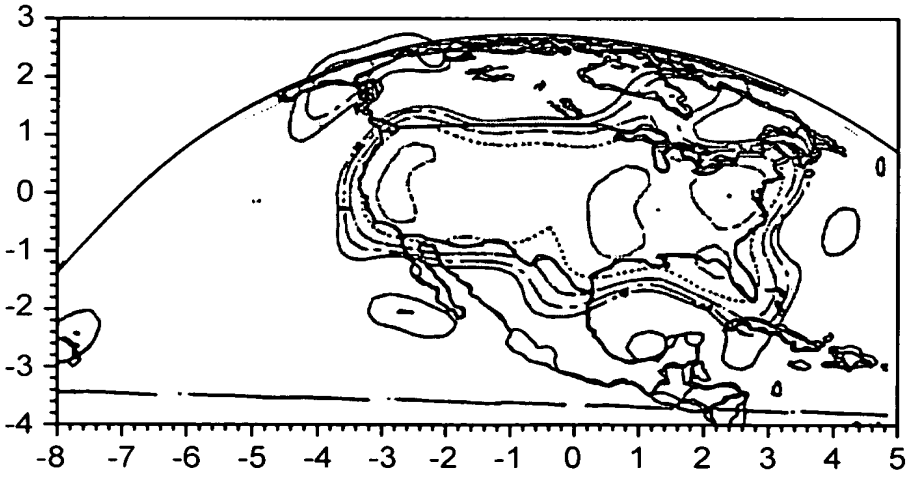

FIG. 7B

Phase-Only Optimization

Active array, 16x16 elements, El. size = 3.0 wavelength
Paraboloidal-Type Phase Distribution
Contour Levels: -200, -150, -100, -50, 0, 50, 100, 150, 200dB

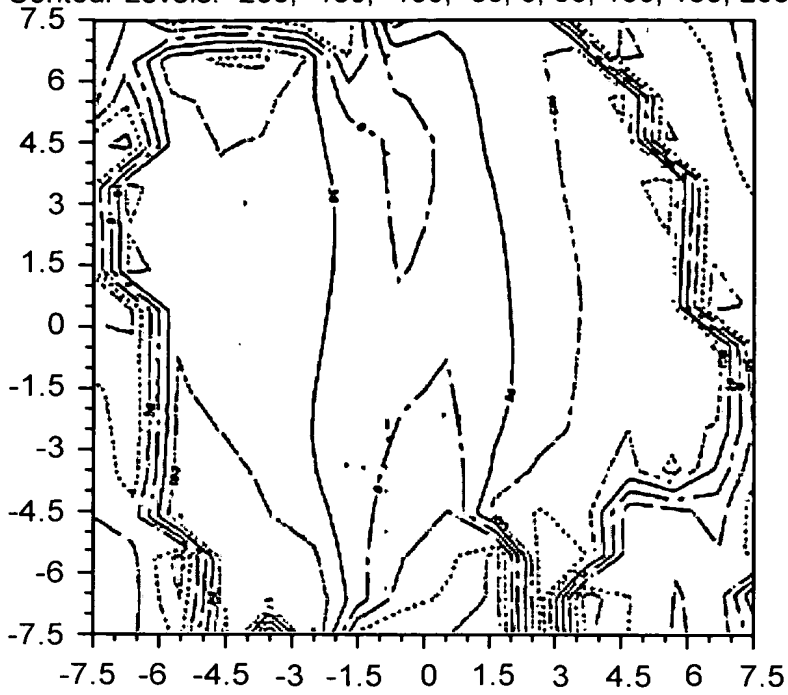

FIG. 8A

Phase-Only Optimization

Active array, 16x16 elements, El. size = 3.0 wavelength
Saddle-Type Phase Distribution
Contour Levels: -200, -150, -100, -50, 0, 50, 100, 150, 200dB

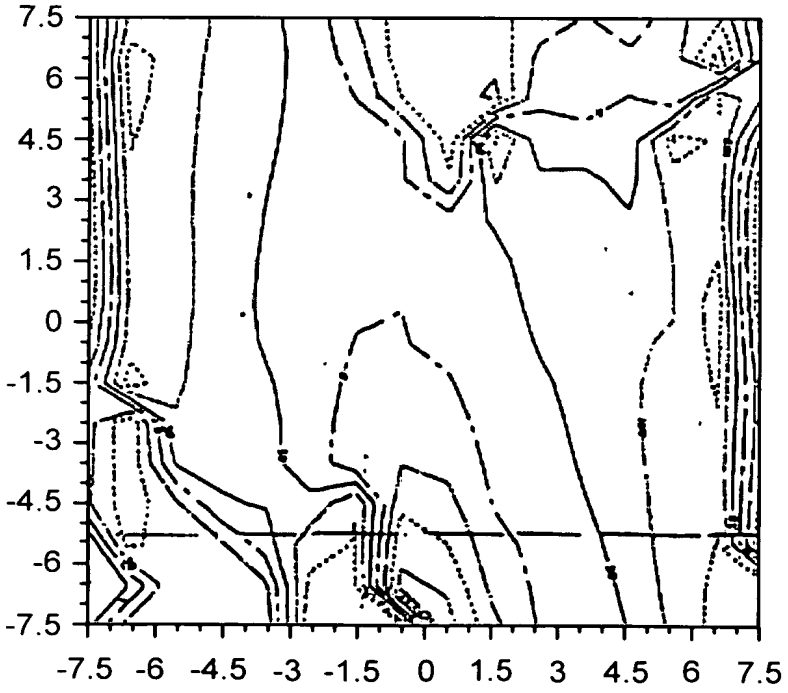

FIG. 8B

Ku-Band

Active array, 16x16 alam. alcm size = 3.0 lamda
EIRP-Optimized Pattern with Paraboloidal-Type Phase
C/13 Pattern, Minimum = 11.5dB

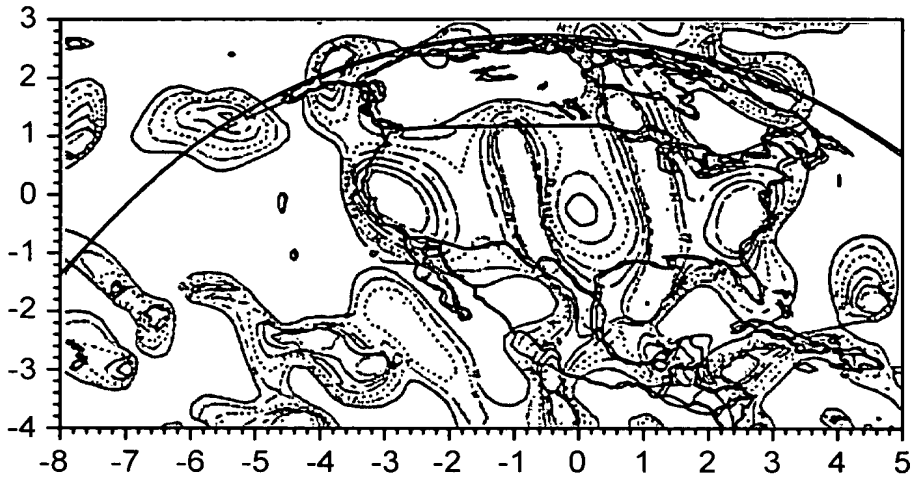

FIG. 9A

Ku-Band

Active array, 16x16 alam. alcm size = 3.0 lamda
EIRP-Optimized Pattern with Saddle-Type Phase
C/13 Pattern, Minimum = 12.0dB

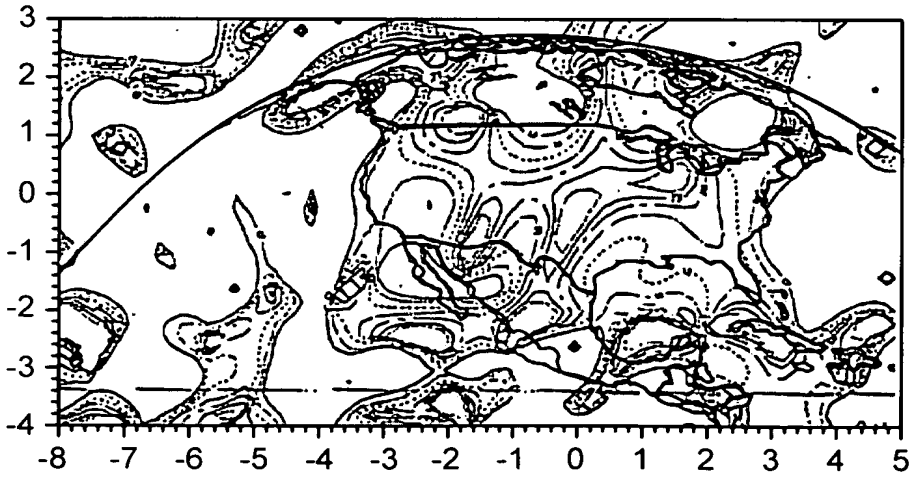

FIG. 9B

Ku-Band

Active array, 16x16 alam. alcm size = 3.0 lamda
EIRP-Optimized Pattern with Saddle-Type Phase
Relative Pattern, EIRP Reduction due to IM-Opi = 0.17 dB

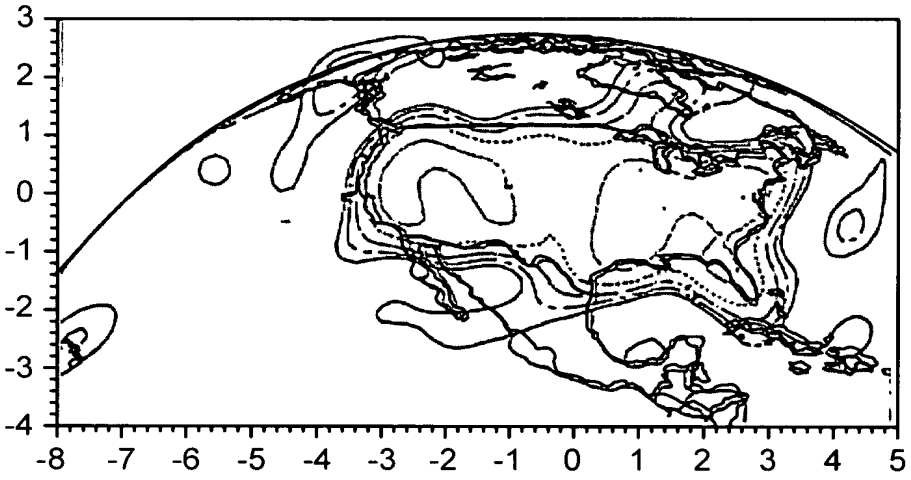

FIG. 10

Ku-Band

Active array, 16x16 alam. alcm size = 3.0 lamda
EIRP & IM Optimized Pattern with Saddle-Type Phase
C/I_3 Pattern, Minimum = 23.4dB, EIRP Reduction = 0.17db

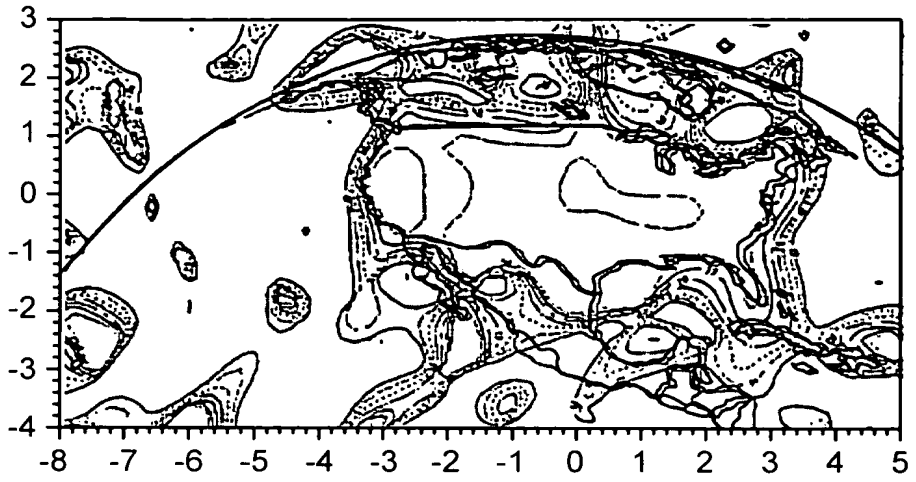

FIG. 11A

Ku-Band

Active array, 16x16 alam. alcm size = 3.0 lamda
EIRP & IM Optimized Pattern with Saddle-Type Phase
C/I_5 Pattern, Minimum = 27.4dB, EIRP Reduction = 0.17db

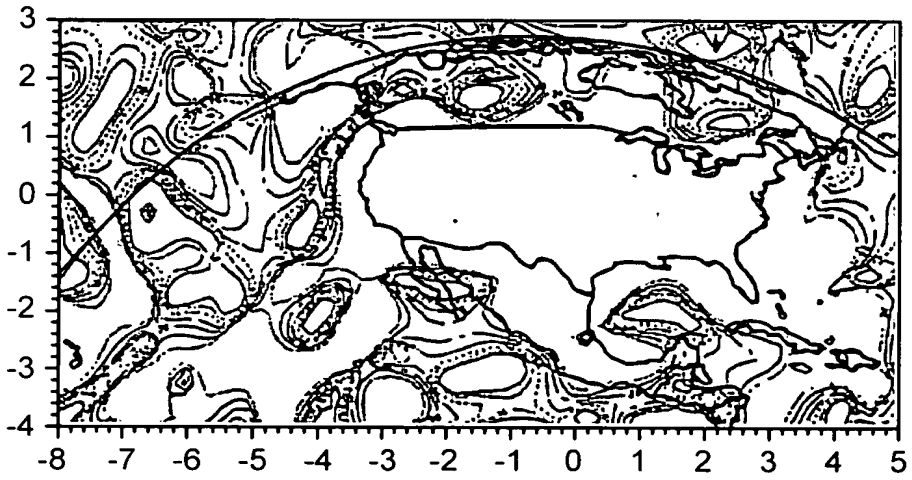

FIG. 11B

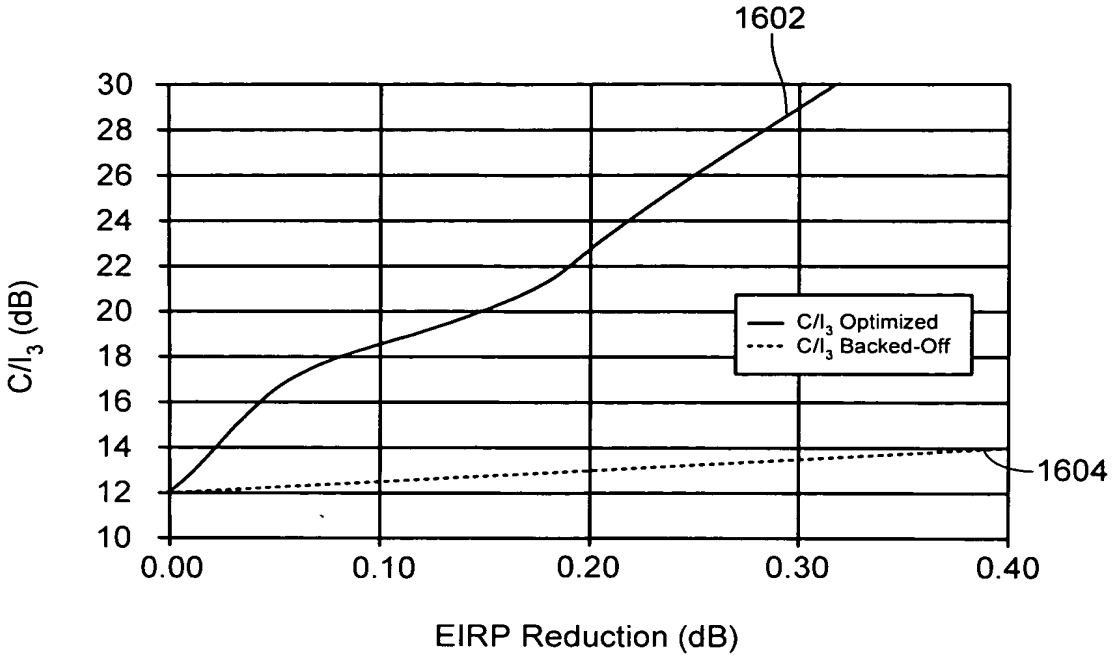
1602
30
28
26
24
22
20
18
16
14
12
10
C/I3 (dB)
C/I3 Optimized
C/I3 Backed-Off
1604
0.00
0.10
0.20
0.30
0.40
EIRP Reduction (dB)

FIG. 12

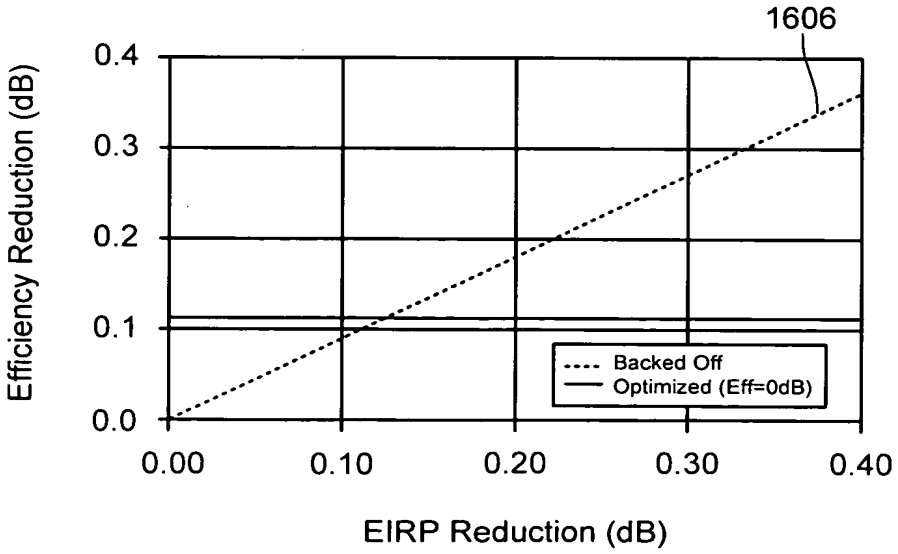
1606
0.4
0.3
0.2
0.1
0.0
Efficiency Reduction (dB)
Backed Off
Optimized (Eff=0dB)
0.00
0.10
0.20
0.30
0.40
EIRP Reduction (dB)

FIG. 13

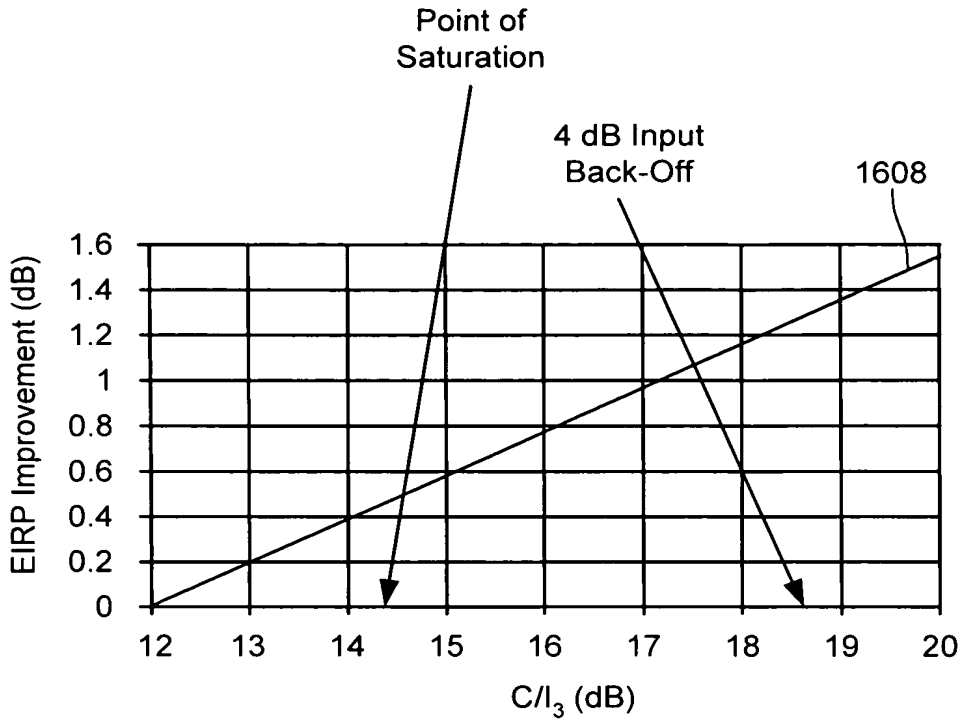
Point of
Saturation
4 dB Input
Back-Off
1608
EIRP Improvement (dB)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
12
13
14
15
16
17
18
19
20
C/I3 (dB)

FIG. 14

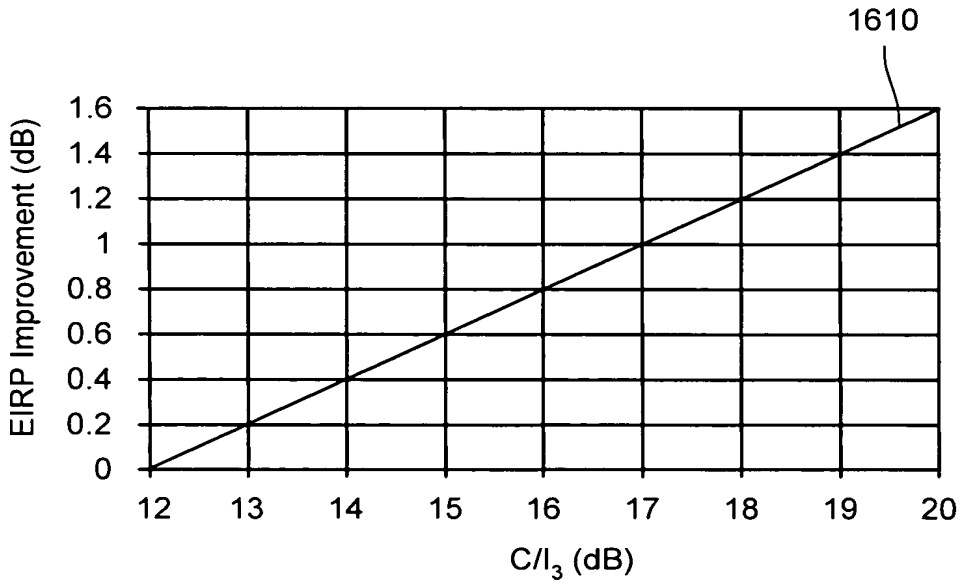
1610
EIRP Improvement (dB)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
12
13
14
15
16
17
18
19
20
C/I3 (dB)

FIG. 15

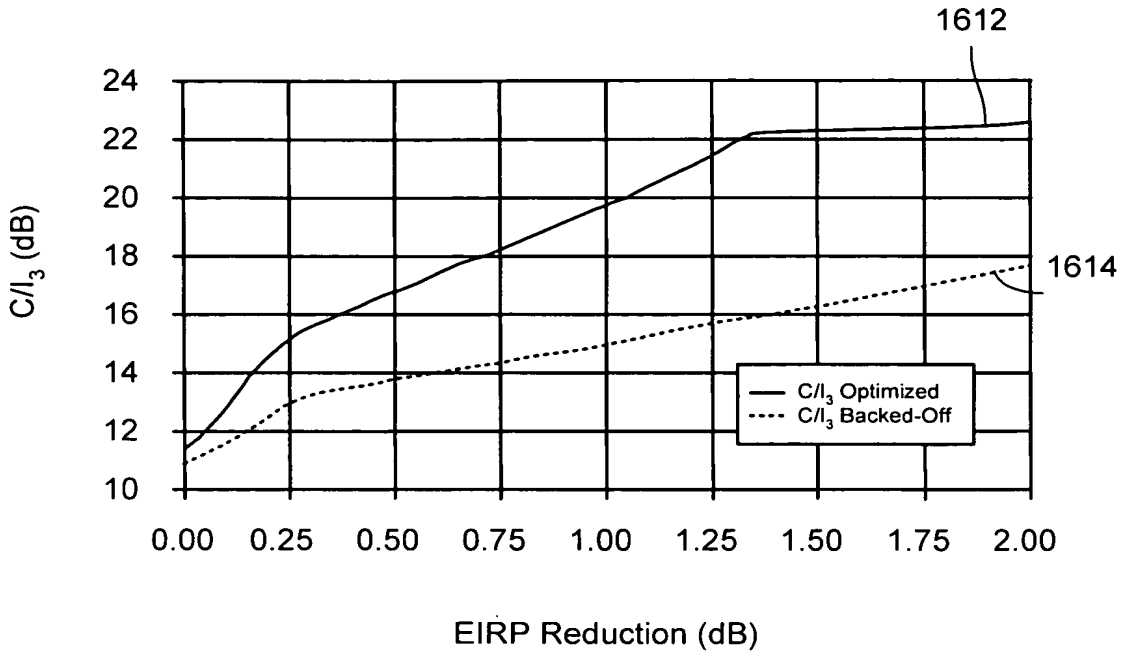
1612
1614
24
22
20
18
16
14
12
10
C/I3 (dB)
C/I3 Optimized
C/I3 Backed-Off
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
EIRP Reduction (dB)

FIG. 16

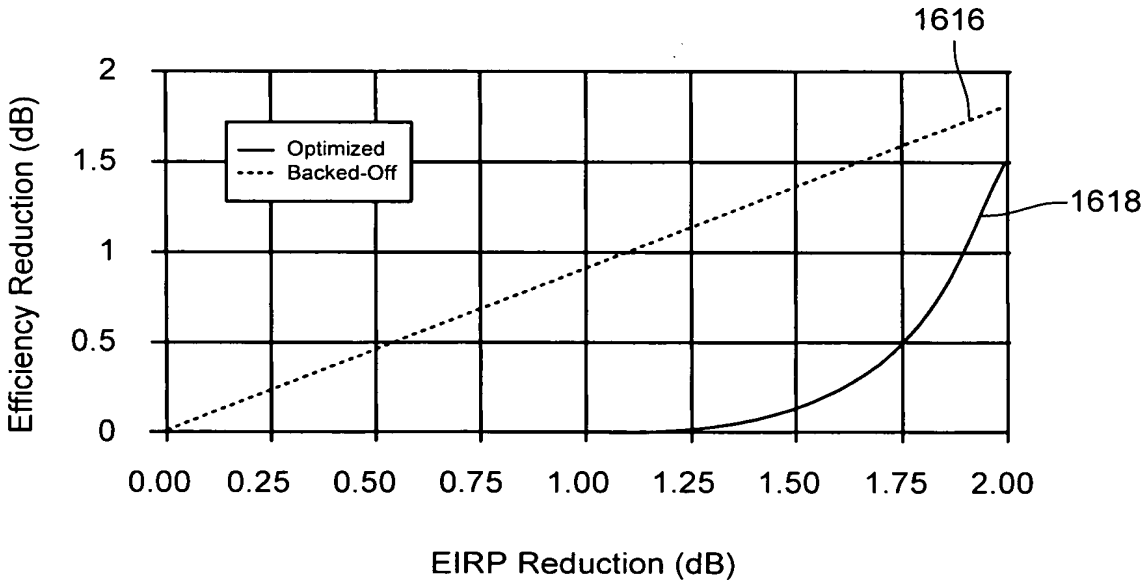
1616
1618
2
1.5
1
0.5
0
Efficiency Reduction (dB)
Optimized
Backed-Off
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
EIRP Reduction (dB)

FIG. 17

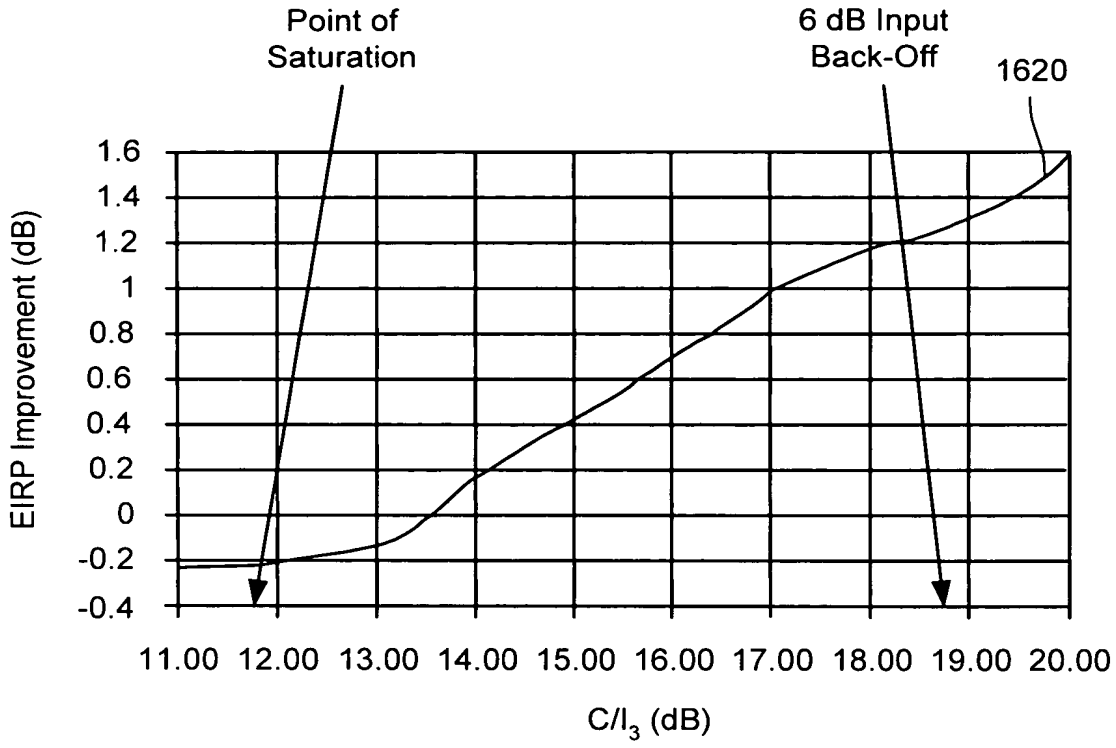
Point of Saturation
6 dB Input Back-Off
1620
EIRP Improvement (dB)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 20.00
C/I3 (dB)

FIG. 18

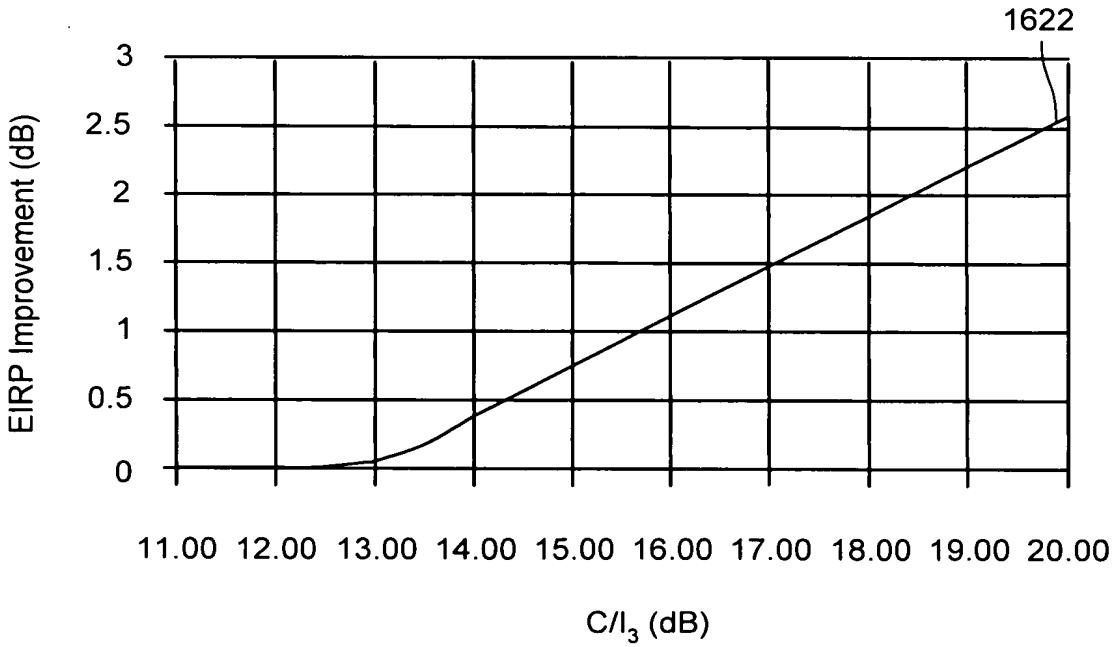
1622
EIRP Improvement (dB)
3
2.5
2
1.5
1
0.5
0
11.00 12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 20.00
C/I3 (dB)

FIG. 19